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10/820,822	04/09/2004	Hae-Kyoung Kim	61610134US	8493

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EXAMINER	
WANG, EUGENIA	
ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATENT@PARK-LAW.COM

Office Action Summary	Application No.	Applicant(s)	
	10/820,822	KIM ET AL.	
	Examiner	Art Unit	
	EUGENIA WANG	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1, 3, 4, 6, 7, and 9-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *20* is/are allowed.

6)☒ Claim(s) *1, 3, 4, 6, 7, 9, 11, 13, 15, 17-19, 21, and 22* is/are rejected.

7)☒ Claim(s) *10,12,14,16 and 23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment filed January 23, 2008:

a. Claims 2, 5, and 8 have been cancelled as per Applicant's request. Claims 21-23 have been added. Claims 1, 3, 4, 6, 7, and 9-23 are pending.

b. The previous claim objection has been withdrawn in light of the amendment.

c. The previous 112 rejection has been withdrawn in light of the amendment.

d. The core of the previous rejection has been maintained, with any changes as necessitated by the amendment. Thus, the action is final.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 17 rejected under 35 U.S.C. 102(e) as being anticipated by US 6890674 (Beckmann et al.).

As to claim 17, Beckmann et al. teach the use of Nafion, which expands (changes volume) relative to methanol concentration is used as a switch, valve, or sensor in a fuel cell (col. 8, lines 7-25). It is shown in fig. 7A and 7B that the sensor film

is on a substrate. Fig. 8 depicts the sensor embodiment having a conductor [70] fastened to Nafion material [72]. The sensor embodiment of Nafion communicates a concentration level of methanol (thus outputting a signal) (col. 8, lines 37-38). The Nafion conductor displays such a signal via known resistance values, wherein relaxed and strained Nafion have different resistance values. The methanol concentration affects this and thus sends the resistance values in comparison to known values. In this manner, a signal is output with respect to an expansion coefficient. These signals sent correspond to values that can be interpreted as both within and not within a defined reference range (barring clear definition of what constitutes a reference range). Furthermore, Beckmann et al. teach that Nafion expansion and resistance are both proportional to methanol concentration (col. 8, lines 57-60). Accordingly, a reference range with respect to resistance inherently corresponds to a reference range of expansion coefficients of the sensor film. Additionally, the sensor as taught by Beckmann et al. would be capable of sending out a signal when an expansion coefficient of the sensor is not within a reference range of expansion coefficients of the sensor film, as it outputs signals with respect to the expansion of Nafion (see the second embodiment in col. 8).

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson,* 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended

use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

3. Claim 18 is rejected under 35 U.S.C. 102(e) as being anticipated by Beckmann et al. as evidenced by US 2003/0091887 (Ihonen et al.) and DuPont – Nafion Membranes and Dispersions.

As to claim 18, Nafion (the material taught by Beckmann et al.) is proton conducting polymer (as evidenced by Ihonen et al. (para 0003) and Nafion Membranes and Dispersions).

Response to Arguments

4. Applicant's arguments filed January 23, 3008 have been fully considered but they are not persuasive.

With respect to claim 17, Applicant argues that Beckmann et al. does not disclose that a signal is output when an expansion coefficient of the sensor film is not within a reference range of expansion coefficients of the sensor film.

Examiner respectfully disagrees. The previous rejection has been modified to encompass the newly added limitations. Examiner's position is reiterated herein for clarity's sake. Fig. 8 of Beckmann et al. depicts the sensor embodiment having a conductor [70] fastened to Nafion material [72] (sensor film). The sensor embodiment of Nafion communicates a concentration level of methanol (thus outputting a signal) (col. 8, lines 37-38). The Nafion conductor displays such a signal via known resistance values, wherein relaxed and strained Nafion have different resistance values. The methanol concentration affects this and thus sends the resistance values in comparison to known values. In this manner, a signal is output with respect to an expansion coefficient. These signals sent correspond to values that can be interpreted as both within and not within a defined reference range (barring clear definition of what constitutes a reference range). Furthermore, Beckmann et al. teach that Nafion expansion and resistance are both proportional to methanol concentration (col. 8, lines 57-60). Accordingly, a reference range with respect to resistance inherently corresponds to a reference range of expansion coefficients of the sensor film. Additionally, the sensor as taught by Beckmann et al. would be capable of sending out a

signal when an expansion coefficient of the sensor is not within a reference range of expansion coefficients of the sensor film, as it outputs signals with respect to the expansion of Nafion (see the second embodiment in col. 8). See the rejection of claim 17 for the Office's position on "capable of" for apparatus claims. Since resistance and expansion coefficients are linked, as taught by Beckmann et al., the reference range of one inherently corresponds to the reference range of another. At the very least, the system of Beckmann et al. is capable of functioning in the same way, as expansion of the Nafion sensor with respect to concentration is taken into account. Therefore, the rejection is maintained.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 3, 4, 6, 7, 9, 11, 15, 13, 21, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6303244 (Surampudi et al.) in view of Beckmann et al.

As to claim 1, Surampudi et al. discloses a direct methanol feed fuel cell system. The system is composed of a fuel cell stack [924], a methanol fuel storage tank [900], a circulating tank [906], condensers [940, 942] (which acts as a diluent storage unit that stores only a diluent that is a byproduct of the chemical reaction in the fuel cell stack), and a methanol concentration sensor that provides input to a controller to regulate the fuel cell system (col. 18 lines 5-19; See Figure 9). The fuel cell stack is comprised of an anode and cathode and generates electrical energy (col. 3 lines 25-32).

Surampudi et al. does not disclose that the sensor comprises a sensor film or sensor member that changes volume thereof depending on the concentration of the fuel.

Beckmann et al. teaches a method and apparatus for managing fluids in a fuel cell system. Beckmann teaches the use of various devices to control fuel concentration in a direct oxidation fuel cell system such as a direct methanol fuel cell (col. 1 lines 39-42; col. 2 line 63 to col. 3 line 4). One device for determining the concentration of the

fuel is a sensor (col. 3 lines 50-62). The sensor is constructed of Nafion™ (serves as sensor film and sensor member) The Nafion™ expands or varies in volume when exposed to a methanol solution (col. 8 lines 8-16). The amount of expansion experienced by the Nafion™ is directly related to the concentration of methanol fuel. The amount Nafion™ expands is predictable and essentially linear over the relevant methanol concentrations (col. 8 lines 21-25). The motivation to use the concentration sensor is to accurately measure and control the methanol concentration provided to the fuel cell. Furthermore, one of ordinary skill in the art would have been able to appreciate the use of the concentration sensor as taught by Beckmann et al. in the system of Surampudi et al. with reasonable expectation of success. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the system of Surampudi et al. to include Nafion™ (a material that varies in volume depending on the concentration of the methanol solution to which it is exposed) as taught by Beckmann et al. in order to accurately measure and control the methanol concentration provided to the fuel cell, as one of ordinary skill in the art would have appreciated the changing of methanol sensors with reasonable expectation of success.

As to claim 3, Surampudi et al. teach of a fuel mixing unit (circulation tank [906]). Circulation tank [906] is a fuel mixing unit, as it allows the diluent from condenser [940, 942] to flow into it as well as methanol from the fuel storage unit (methanol tank [900]).

As to claim 4, Surampudi et al. teaches that the methanol sensor should be located in the methanol fuel or very close to the methanol fuel (col. 18 lines 14-15).

As to claim 6, Surampudi et al. teach a line between the fuel storage unit (methanol tank [900]) and the diluent storage unit (condensers [940, 942]). This line is [918], and it supplies the fuel mixture to the fuel cell stack (fig. 9).

As to claim 7, Surampudi et al. show sensor [916] is located in line [918] (fig. 9).

As to claim 9, Surampudi et al. does not teach that the sensor comprises a substrate, a sensor film attached to a surface of the substrate, wherein the sensor film changes volume depending on the concentration of the fuel in the fuel mixture solution.

Beckmann et al. teach the use of Nafion, which expands (changes volume) relative to methanol concentration is used as a switch, valve, or sensor in a fuel cell (col. 8, lines 7-25). It is shown in fig. 7A and 7B that the sensor film is on a substrate. The motivation to use the concentration sensor is to accurately measure and control the methanol concentration provided to the fuel cell. Furthermore, one of ordinary skill in the art would have been able to appreciate the use of the concentration sensor as taught by Beckmann et al. in the system of Surampudi et al. with reasonable expectation of success. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the system of Surampudi et al. to include Nafion™ (a material that varies in volume depending on the concentration of the methanol solution to which it is exposed) as taught by Beckmann et al. in order to accurately measure and control the methanol concentration provided to the fuel cell, as one of ordinary skill in the art would have appreciated the changing of methanol sensors with reasonable expectation of success.

As to claim 13, Beckmann et al. teaches a sensor using Nafion embodied in fig. 8. In this embodiment, the sensor is an electronic circuit that outputs signals depending on the change in the volume sensor. This is done as Nafion communicates a concentration level of methanol (col. 8, lines 37-38). The Nafion conductor displays such a signal via known resistance values, wherein relaxed and strained Nafion have different resistance values. These signals sent are in some way electronic, as the sensor is an electronic circuit (fig. 8; col. 8, lines 37-67).

As to claims 21 and 22, Beckmann et al.'s yields the control system claimed. Fig. 8 depicts the sensor embodiment having a conductor [70] fastened to Nafion material [72] (sensor film). The sensor embodiment of Nafion communicates a concentration level of methanol (thus outputting a signal) (col. 8, lines 37-38). The Nafion conductor displays such a signal via known resistance values, wherein relaxed and strained Nafion have different resistance values. The methanol concentration affects this and thus sends the resistance values in comparison to known values. In this manner, a signal is output with respect to an expansion coefficient. These signals sent correspond to values that can be interpreted as both within and not within a defined reference range (barring clear definition of what constitutes a reference range). Furthermore, Beckmann et al. teach that Nafion expansion and resistance are both proportional to methanol concentration (col. 8, lines 57-60). Accordingly, a reference range with respect to resistance inherently corresponds to a reference range of expansion coefficients of the sensor film. Additionally, the sensor as taught by Beckmann et al. would be capable of sending out a signal when an expansion

coefficient of the sensor is not within a reference range of expansion coefficients of the sensor film, as it outputs signals with respect to the expansion of Nafion (see the second embodiment in col. 8).

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson,* 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural

limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

6. Claims 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Surampudi et al. in view of Beckmann et al., as applied to claims 1 and 9, as evidenced by Ihonen et al. and DuPont – Nafion Membranes and Dispersions.

As to claims 11 and 15, Nafion (the material taught by Beckmann et al.) is proton conducting polymer that is a perfluorinated sulfonic acid polymer (as evidenced by Ihonen et al. (para 0003) and Nafion Membranes and Dispersions).

7. Claim 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Beckmann et al., as applied to claim 17, in view of Surampudi et al.

With respect to claim 19, Beckmann et al. teaches the use of Nafion as the sensor but does not teach the use of polystyrene sulfonic acid, poly ether ether sulfone sulfonic aced, sulfonated polyolefin, or sulfonated polysulfone as the polymeric ion exchange membrane in the sensor.

Surampudi et al. demonstrates that Nafion and polyethylene and polypropylene sulfonic acids (sulfonated polyolefins) and polystyrene sulfonic acids are function equivalents within the use of a fuel cell (col. 6, lines 55-57). Therefore, one of ordinary skill in the art at the time the invention was made would have found it obvious to substitute the Nafion of the sensor of Beckmann et al. with sulfonated polyolefins or polystyrene sulfonic acids, as taught by Surampudi et al., with predictable result of obtaining a sensor that functioned in the same manner. It has been held to be within the general skill of a worker in the art to select a known material on the basis of its

suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416.

Response to Arguments

8. Applicant's arguments filed January have been fully considered but they are not persuasive.

With respect to claim 1, Applicant argues that Surampudi et al. does not teach of a diluent storage unit that stores only a diluent that is a byproduct of the chemical reaction of the fuel cell stack, wherein Applicant specifically argues that recycled methanol is not a byproduct of the chemical reaction.

Examiner respectfully disagrees and would like to clarify the position taken with Surampudi et al. Examiner points to fig. 9. Although condenser [940] contains methanol (as it is recycled exhaust from the anode side), as supported by the description of line [946] from condenser [940] (col. 18, line 37-29), this simply is not true for the exhaust of the cathode exhaust (which is routed through condenser [942]). It can be said that condenser [942] carries no methanol (and thus only carries byproduct), since the line leading from [948] only carries water and air (col. 18, lines 53-54). Additionally, as part of the cathode exhaust side, water and air are separated to vent exhaust air in [950], wherein water is recycled back to circulation tank [902]. It is unclear how the cathode recycle portion of Surampudi et al. does not teach the claimed invention, wherein the diluent storage unit is not only encompassed by condenser [942]33 but portion [950] as well. For those reasons, the rejection is maintained.

With respect to the arguments regarding the 103 rejections, Applicant argues that the prior art used to obviate the rejected claims do not cure the deficiencies of the primary reference. Applicant does not argue how the combination is not proper. Therefore, the Examiner maintains the obviousness rejections and upholds the rejection of the primary reference, as above.

Allowable Subject Matter

9. Claims 10, 12, 14, 16, and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In the non-final office action mailed on October 29, 2007, Examiner has already set for the reasons for allowance of claim 10. Since claims 12, 14, 16, and 23 are dependent on claim 10, they are allowable for the same reasons.

10. Claim 20 is allowed.

In the non-final office action mailed on October 29, 2007, Examiner has already set for the reasons for allowance of claim 20.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENIA WANG whose telephone number is (571)272-4942. The examiner can normally be reached on 7 - 4:30 Mon. - Thurs., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/E. W./
Examiner, Art Unit 1795

/Gregg Cantelmo/
for E. Wang, Examiner of Art Unit 1795